

Stiphodon kalfatak, a new species of freshwater goby from Vanuatu (Gobioidae: Sicydiinae)

by

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ABSTRACT. - *Stiphodon kalfatak*, a new species, is described on the basis of material collected from Vanuatu. It is distinguished from all other congeners in having 9 segmented rays in the second dorsal fin, usually 14(4)-15(4) pectoral rays, 39-44 tricuspid premaxillary teeth, 1 small symphyseal tooth in females vs 3-4 stout teeth in males, and in having a low number of scales in transverse forward (7-8) and back series (8-9). Males have on the flanks a longitudinal bright line divided in three colours (red, yellow and green) and females are grayish to brownish.

RÉSUMÉ. - *Stiphodon kalfatak*, une espèce nouvelle de gobie d'eau douce du Vanuatu (Gobioidae : Sicydiinae).

Stiphodon kalfatak, espèce nouvelle, est décrite à partir de matériel collecté au Vanuatu. Elle se distingue des autres espèces du genre en ayant neuf rayons segmentés à la seconde nageoire dorsale, 14(4)-15(4) rayons aux nageoires pectorales, 39 à 44 dents prémaxillaires tricuspidées, une petite dent symphyséale chez les femelles et trois à quatre chez les mâles, moins d'écaillies en séries transversales postérieure (8-9) et antérieure (7-8). Les mâles ont une bande longitudinale brillante à trois couleurs (rouge, jaune et vert) sur les flancs et les femelles sont grises à brun clair.

Key words. - Gobioidae - *Stiphodon kalfatak* - Vanuatu - Freshwater - Sicydiinae - New species.

The freshwater ichthyofauna of Vanuatu is rich and varied, but remained poorly sampled until 1998 and, as a result, little has been published on these animals (see Keith *et al.*, 2004a). In October and November 1998 the Environment Unit of Vanuatu sponsored a survey of freshwater environments throughout the islands of Vanuatu (Gerbeaux *et al.*, 1998; Keith *et al.*, 2004a, 2004b). In July 2002, 2003 and 2005, in addition to the 1998 survey, the first author conducted surveys of fishes occurring in freshwater streams and rivers on the islands of Santo, Tanna, Ambae, Efate and Gaua. During these surveys more species of *Stiphodon* were caught and among them, a new species.

The purpose of this paper is to provide a description of *Stiphodon kalfatak* n. sp., a freshwater goby known from Vanuatu.

METHODS

Methods follow those in Keith and Marquet (2007) and Watson *et al.* (2005). All lengths of specimens are expressed to the nearest tenth of a millimetre (mm) and then that value rounded to the nearest whole percent of standard length (SL). Jaw length is measured from anterior tip of upper jaw to posterior edge of maxilla. Scales in a lateral series are

counted from upper pectoral base and along the middle of the body laterally to the central hypural base. Body depth is measured from anterior base of second dorsal fin to belly, this measurement is taken only from males as females vary considerably from gravid to non gravid state. Transverse back series refers to scales counted from the first scale anterior to second dorsal fin, in a diagonal manner, posteriorly and ventrally to the anal fin base or to the ventralmost scale. Transverse forward series refers to scales counted from the first scale anterior to second dorsal fin, in a diagonal manner, anteriorly and ventrally to the centre of belly or to the ventralmost scale. Zigzag series refers to scales on the narrowest region of the caudal peduncle counted from the dorsalmost scale to the ventralmost scale in a zigzag (alternating) manner.

Abbreviations used to represent the cephalic sensory pore system follow Akihito (1986). Abbreviations used to represent collections and institutions cited follow Leviton *et al.* (1985), except BLIH (Biological Laboratory, Imperial Household, Chiyoda-ku, Tokyo, Japan) formerly LICPP.

Diagrammatic illustrations of the head and the urogenital papilla are not provided in this work because morphologically little variation exists among the species so far described from streams flowing into the Pacific Ocean (Watson *et al.*, 2005).

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Counts and morphometrics are summarized in tables I, II and III.

Comparative material

The new species is compared, in text and tables, with species from Vanuatu, and nearby area, in particular *Stiphodon astilbos* Ryan, 1986, *S. birdsong* Watson, 1996, *S. surrufus* Watson & Kottelat, 1995, and *S. sapphirinus* Watson *et al.* 2005, because these have usually 14 pectoral rays and 9 segmented rays in the second dorsal fin.

Stiphodon rutilaureus is a species occurring in Vanuatu, but it has 10 rays in the second dorsal fin and therefore further comparison is unnecessary in tables.

Stiphodon astilbos. - AMS I.25714-001, holotype, male (22.0 mm SL); Vanuatu: Sanma Province: Espiritu Santo: South Santo Dispensary: small slightly turbid stream ca. 50 m from sea; 8 Feb. 1982, P. Ryan. - AMS I.25713-001, paratypes, 2 males, 1 female (15.4-16.3 mm SL); same collection data as holotype. - MNHN 2004-848, 1 male, 1 female (36.2-38.5); Vanuatu: Shefa Province: Efate: Tagabe River; 6 Oct. 1998, Vanuatu Department of Conservation. - MNHN 2004-849, 1 female, 1 juvenile (17.2-23.2 mm SL); Vanuatu: Penama Province: Pentecost: Watmansebai River; 12 Oct. 1998, Vanuatu Department of Conservation.

Stiphodon rutilaureus. - MNHN 2004-0574, Vanuatu, Tanna, Ivaru River; 19 Jul. 2003, Keith P., Marquet G. and Keith J., coll. - MNHN 2005-1888, Vanuatu, Santo, Waylapa River; 15 Jul. 2005, Keith P., Marquet G. and Keith J., coll.

Comparative material for *Stiphodon birdsong*, *S. surrufus*, and *S. sapphirinus* is that listed in Watson *et al.* (2005) and in Keith and Marquet (2007).

STIPHODON KALFATAK NEW SPECIES

(Figs 1-2, Tabs I-III)

Material examined

Eight specimens collected from Vanuatu totalling five males and three females with a size range of 19.4-23.8 mm SL; largest male 22.9 mm SL, largest female 23.8 mm SL.

Holotype. - MNHN 2006-805, male (21.8 mm SL); Namata River, Santo Island, Vanuatu; 22 July 2003; Keith P., Marquet G. and Keith J., coll.

Paratypes. - MNHN 2006-806, 4 males, 3 females (19.4-23.8 mm SL); same data as holotype.

Diagnosis

A combination of characters distinguishes *Stiphodon kalfatak*. The species has 14(4)-15(4) pectoral rays, 9 segmented rays in the second dorsal fin and 39-44 premaxillary teeth. There are 4-12 scales in predorsal midline. The males have more and larger symphyseal teeth than females (3-4 vs 1). The species has 7-8 scales in transverse forward series and 8-9 in transverse back series. The coloration of males is typical: the body has a longitudinal bright line divided in three colours (red, yellow and green, from back to belly) on the flanks and continuing along the head, on the cheeks, to the nose. The lower part of the head is dark green to black. The belly is greyish brown on the back. The females are greyish to brownish.



Figure 1. - *Stiphodon kalfatak*, paratype, MNHN 2006-806, male; Santo Island, Namata River, Vanuatu; 22 July 2003; Keith P., Marquet G. and Keith J., coll. (Photo by P. Keith).

Figure 2. - *Stiphodon kalfatak*, paratype, MNHN 2006-806, female; Santo Island, Namata River, Vanuatu; 22 July 2003; Keith P., Marquet G. and Keith J., coll. (Photo by P. Keith).

Table I. - Premaxillary teeth in *Stiphodon kalfatak* and related species. [*Dents prémaxillaires de Stiphodon kalfatak et des espèces proches.*]

	Premaxillary teeth																											
	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
<i>Stiphodon</i> sp.																1	1	1	-	3	2							
<i>Stiphodon astilbos</i>			1	-	-	1	1	1	-	1	1																	
<i>Stiphodon sapphirinus</i>							1	3	5	1	3		4	5	7	1	3	2	1	2	-	-	1	1	1	-	1	
<i>Stiphodon birdsong</i>			1	-	2	6	8	10	14	8	3	7																
<i>Stiphodon surrufus</i>	1	1	1	-	-	-	-	1	-	2	-	1																

Table II. - Scale counts in *Stiphodon kalfatak* and related species. [*Méristique chez Stiphodon kalfatak et les espèces proches.*]

		Lateral scales																																			
		12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36											
<i>Stiphodon</i> sp.																		2	-	1	2	2	2	1													
<i>Stiphodon astilbos</i>											1	1	2	2	4	5	5	9	3	3	3	2	1	1	1												
<i>Stiphodon sapphirinus</i>																																					
<i>Stiphodon birdsong</i>		1	-	2	6	3	7	5	8	6	5	4	2	4	2	-	2	2	2	-	1	1	1														
<i>Stiphodon surrufus</i>												1	-	-	1	1	-	-	-	-	1	1	-	-	-	-	1										
		Transverse back series								Transverse forward series																											
		8	9	10	11	12	13	14	15		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18								
<i>Stiphodon</i> sp.		2	6															2	6																		
<i>Stiphodon astilbos</i>			7																				2	2	2	-	1										
<i>Stiphodon sapphirinus</i>				40	1	1												2	3	6	7	8	6	5	3	2											
<i>Stiphodon birdsong</i>		4	3	3	14	16	14	7	1	2	-	2	6	2	7	7	13	9	5	4	4	1	1	-	-	-	-	-	-	-	-	-	1				
<i>Stiphodon surrufus</i>				2	-	2	2	1		1	-	-	-	1	-	-	-	-	3	-	-	2															
		Predorsal midline (M: male, F: female)																																			
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17																		
<i>Stiphodon</i> sp. M						1	2	1	1																												
<i>Stiphodon</i> sp. F											1	-	1	1																							
<i>Stiphodon astilbos</i> M					1	-	-	-	1	-	-	1	1																								
<i>Stiphodon astilbos</i> F					1	-	-	-	-	-	1	-	-	1																							
<i>Stiphodon sapphirinus</i> M		27	-	1																																	
<i>Stiphodon sapphirinus</i> F		3	-	-	1	-	-	1	3	2	-	1	1	1																							
<i>Stiphodon birdsong</i> M		32																																			
<i>Stiphodon birdsong</i> F			55																																		
<i>Stiphodon surrufus</i> M		3																																			
<i>Stiphodon surrufus</i> F			2	-	1																																

Description

Scale counts in *Stiphodon kalfatak* and related species are given in table II, number of premaxillary teeth in table I, and morphometrics in table III. Below, the holotype counts are given first followed in brackets, if different, by the paratype counts.

Dorsal fins VI-I,9, first dorsal fin separate from and same height as second dorsal fin; spines 2, 3, 4 of first dorsal fin longer but not filamentous. Anal fin I,10 and directly opposite to second dorsal fin. Pectoral fin has 14(4)-15(4) rays, uppermost rays extending beyond membrane but not appearing feathery or silky, lowermost 1 or 2 rays simple; pectoral fin oblong with posterior margin rounded. Caudal fin has 13 (12-13) branched rays, posterior margin rounded. Pelvic disc always has 1 spine and 5 stout and heavily branched segmented rays. Fifth rays joined together in their entire length forming a strong cup-like disc; disc adherent to belly between fifth rays only; between spines, a strong fleshy frenum.

Scales in lateral series 31 (30-34); those on caudal peduncle, sides and back are ctenoid and they become

cycloid on the nape. Most anterior scale along midline near upper pectoral base.

Scales in transverse backward series 9 (8-9). Scales in transverse forward series 7 (7-8) with scales well developed at origin of second dorsal fin. Scales in zigzag series 9 (8-11). More scales in predorsal midline in females (9-12) than in males 5 (4-7). Females usually have a few small cycloid scales close to urogenital papilla and anus. Usually no scales on male belly; if present they are cycloid. Head and pectoral base are scaleless.

Premaxillary teeth 39-44, fine and tricuspid, tridentiform with central cusp longer than lateral cusps. Dentary symphyseal teeth in males 3 (3-4) (female, 1), conical to caniniform, stronger and larger.

Cephalic sensory pore system always A, B, C, D, F, H, K, L, N and O; pore D is singular, all others are paired. Oculopercular canal separated into anterior and posterior canals between pores H and K. Cutaneous sensory papillae developed over lateral and dorsal surfaces of head.

Sexual dimorphism and dichromatism well developed with adult males always having bright coloration and longer

Table III. - Morphometrics in *Stiphodon kalfatak* and related species expressed as a percentage of standard length and to the nearest integer. [Morphométrie chez *Stiphodon kalfatak* et les espèces proches, exprimée en pourcentage de la longueur standard et arrondie au nombre entier le plus proche.]

	Predorsal length												Preanal length																			
	31	32	33	34	35	36	37	38	39	40	41	42	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62					
<i>Stiphodon</i> sp							1	2	1	1	2	1																				
<i>Stiphodon astilbos</i>	1	1	2	-	1	-	-	2							1	1	-	1	3	1	1											
<i>Stiphodon sapphirinus</i>				4	7	12	10	6	-	2								3	2	11	6	6	8	2	2	-	1					
<i>Stiphodon birdsong</i>			2	7	20	23	13	2								1	-	3	9	6	10	9	11	10	7							
<i>Stiphodon surrufus</i>				2	1	2	1											1	2	2	-	-	1									
	Head length								Jaw length																							
	19	20	21	22	23	24	25	26	6	7	8	9	10	11	12																	
<i>Stiphodon</i> sp.				1	1	2	1	2	1		1	1	2	4																		
<i>Stiphodon astilbos</i>			1	1	1	1	3				2	1	4																			
<i>Stiphodon sapphirinus</i>			11	18	9	3					11	26	4																			
<i>Stiphodon birdsong</i>	5	25	22	11	5					6	37	23	1																			
<i>Stiphodon surrufus</i>			2	-	4						1	2	2	1																		
	Caudal peduncle length																Caudal peduncle depth				Body depth in males at origin of second dorsal fin											
	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	8	9	10	11	12	11	12	13	14	15	16						
<i>Stiphodon</i> sp.	1	2	2	1	1	1											2	4	2			2	3									
<i>Stiphodon astilbos</i>							2	1	-	1	2	1						5	2			3										
<i>Stiphodon sapphirinus</i>						6	5	15	9	4	1	1					2	14	20	5		11	11	2								
<i>Stiphodon birdsong</i>				1	5	12	25	15	10	2								3	36	33	2	20	11	-	1							
<i>Stiphodon surrufus</i>						1	1	-	4									1	-	4	1	1	-	1	1							
	Second dorsal fin length (M: male, F: female)																															
	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45											
<i>Stiphodon</i> sp. M					3	-	-	-	1	1																						
<i>Stiphodon</i> sp. F		1	-	2																												
<i>Stiphodon astilbos</i> M					1	-	-	2	-	-	-	-	-	-	-	-	-	-	-	1												
<i>Stiphodon astilbos</i> F					1	-	1	-	1																							
<i>Stiphodon sapphirinus</i> M					1	-	-	1	-	3	2	-	1	7	3	3	3	3	1													
<i>Stiphodon sapphirinus</i> F					3	3	5	1	1																							
<i>Stiphodon birdsong</i> M						1	-	3	5	8	6	4	2	1	-	1																
<i>Stiphodon birdsong</i> F				2	9	9	9	5	-	1																						
<i>Stiphodon surrufus</i> M												1	1	1																		
<i>Stiphodon surrufus</i> F				1	1	-	1																									
	Anal fin length (M: male, F: female)																															
	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46												
<i>Stiphodon</i> sp. M				1	-	3	-	-	1																							
<i>Stiphodon</i> sp. F		1	-	-	2																											
<i>Stiphodon astilbos</i> M					1	-	1	-	1	-	-	-	-	-	-	-	-	-	1													
<i>Stiphodon astilbos</i> F					1	1	-	1																								
<i>Stiphodon sapphirinus</i> M					1	1	-	1	-	-	5	1	4	5	5	3	-	2														
<i>Stiphodon sapphirinus</i> F				1	1	3	3	-	2																							
<i>Stiphodon birdsong</i> M									1	6	8	7	6	4																		
<i>Stiphodon birdsong</i> F	1	-	-	-	1	4	12	12	5	1																						
<i>Stiphodon surrufus</i> M												1	-	2																		
<i>Stiphodon surrufus</i> F		1	1	-	-	1																										
	Caudal fin length (M: male, F: female)																															
	18	19	20	21	22	23	24	25	26	27	28	29																				
<i>Stiphodon</i> sp. M					1	1	2	-	1																							
<i>Stiphodon</i> sp. F		1	1	-	1																											
<i>Stiphodon astilbos</i> M					3	-	-	-	-	1																						
<i>Stiphodon astilbos</i> F					1	-	2																									
<i>Stiphodon sapphirinus</i> M		2	-	2	3	5	11	2	2	-	1																					
<i>Stiphodon sapphirinus</i> F		1	-	2	5	2	3	1																								
<i>Stiphodon birdsong</i> M			1	3	3	2	2	2																								
<i>Stiphodon birdsong</i> F			1	1	8	6	1																									
<i>Stiphodon surrufus</i> M									1	2																						
<i>Stiphodon surrufus</i> F				1	-	2																										

second dorsal and anal fins than females. Females with more predorsal scales. Urogenital papilla in males somewhat rectangular with a rounded distal tip, while rectangular in females.

Colour in preservation

Males. - Background of body brownish grey; a thick brownish medial band from origin of pectoral fin to caudal peduncle, more blackish in posterior part of body and con-

tinuing in a thin black line on caudal fin; belly greyish with many light brown spots. The back is brown with six to seven grey areas alternating with brownish ones. Background of head greyish; snout dusky; upper lip blackish; operculum with a dusky band medially situated and adjacent to anterior margin of operculum; nape brownish grey, branchiostegal rays and membrane slightly greyish, breast dusky. First and second dorsal fins hyalines. Anal fin dusky. Pectoral fins are greyish and pectoral base is slightly dusky. Anterior margin of each scale blackish

Females. - Background coloration of head and body mostly cream; a bold but rather blotchy black band extends from tip of snout terminating close to medial region of the hypural base where one to four black spots occur; a second blotchy black band originates as a bar between the nostrils and continues through the eye to dorsal surface of caudal peduncle just posterior to second dorsal fin; a black spot posterior to this on upper caudal peduncle; the back is brown with six to seven grey areas alternating with brownish ones; head and body ventral to midline are without markings. The belly is whitish to greyish.

Colour in life

Males (Fig. 1). - The body has a longitudinal bright line divided in three colours (red, yellow and green, from back to belly) on the flanks and continuing along the head, on the cheek, to the nose. The lower part of the head is dark green to black. The belly is greyish to brownish. The back is brown with six to seven black areas alternating with brownish ones in the upper part. Anterior margin of scales blackish. All fins hyaline, with some brownish pigments along the rays of dorsal fins and on upper base of the pectoral fins.

Females (Fig. 2). - Body generally yellowish to brownish; dusky markings as in preservation: a blotchy black band extends from tip of snout terminating close to medial region of the hypural base where one to four black spots occur; a second blotchy black band originates as a bar between the nostrils and continues through the eye to dorsal surface of caudal peduncle just posterior to second dorsal fin; a black spot posterior to this on upper caudal peduncle. Belly whitish to yellowish.

Distribution

Known from rivers of Vanuatu.

Ecology

Stiphodon kalfatak is found in clear and calm streams with sandy or slightly rocky bottom and large pools. It lives on the bottom of the river. This species was observed from 5 m to 10 m high in altitude.

Comparison

Stiphodon kalfatak differs from *S. birdsong* and *S. surru* -

fus in having less scales in transverse back series (8-9 vs 8-15/10-14), more scales in predorsal series in male (4-7 vs 0/0) and females (9-12 vs 1/1-3) and in lateral series (30-34 vs 12-33/22-36), and in having a longer predorsal length (37-42 vs 33-38/35-38). *Stiphodon kalfatak* differs from *S. sapphirinus* in having less scales in transverse back series (8-9 vs 10-12), in transverse forward series (7-8 vs 7-15) and in predorsal series in males (4-7 vs 0-2). *Stiphodon kalfatak* differs from *S. astilbos* in having more premaxillary teeth (39-44 vs 27-35), lower scale counts in transverse forward series (7-8 vs 12-16) and transverse back series (8-9 vs 9) and in having a longer predorsal length (37-42 vs 31-38) and a shorter caudal peduncle (14-19 vs 20-25).

Etymology

The species is named *kalfatak* to honour Donna Kalfatak in appreciation of her extensive collection efforts to find *Stiphodon* in freshwaters throughout Vanuatu. The new name is treated as a noun in apposition.

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